CONTENTS.

VOL. XXXI.

	Page
Aboriginal dwelling	308
Action of explosives	10
Alteration of coal	180
Analysis of a roof truss	177
Antiseptic treatment of timber	494
Approximations, continued	54
Armor under fire	64
Armor plate trials	225
Automatic brake	83
Automatic lighting of beacons	264
Barometer and the weather	392
Batteries for electric lighting	217
Bayonet, new	351
Beacons, automatic lighting of	264
Beechwood for railway sleepers	440
Behavior of armor under fire	64
Bessemer steel for engineers' tools	346
Bicycles and tricycles	144
Block system	347
Blow-holes in steel and cast iron	260
Boilers, corrosion in	509
Boiler explosions	353
Boilers, defects in	234
Boilers, tests of	106
Book Notices.	
Abbott, Arthur V., Testing Machines	85
Bale, M. P., M.I.M.E., Steam and Machinery Management	264
Barnard, F. A. P., LL. D., Pyramid of Gizeh	174
Bauerman, Hilary, Descriptive Mineralogy	264
Billings, John S., M. D., U. S A, Ventilation and Heating	350
Bowser, Prof. E.A., Analytic Mechanics	524
Brown, J. C., LL. D., Forestry in Norway	262
Brown, J. C., LL.D., Forests and Forestry of Russia	349
Brown, J C., LL.D., Modern Forest Economy	86
Brown, John Croumbie, LL. D, Forestry in the Mining Districts of the Ural Mountains	523
Cain, Prof. Wm., C.E., Algebra of Algebraic Numbers	85
Collier, P., Ph. D., On Sorghum	263
Davies, D. C., T.G.S., Minerals and Mining	349
Dissler, M., M. E., Modern High Explosives	173
Ferral, Prof Wm., Temperature of the Atmosphere at the Earth's Surface	262
Gerhard, Wm. P., House Drainage and Sanitary Plumbing	350
Gerhard, Wm. P., Drainage and Sewage of Dwellings	175
Gray, Andrew, M. A., Measurements in Electricity and Magnetism	87
Greenwood, W. H., T. C. S., Steel and Iron	174
Gordon, J. E. H., B.A., Electric Lighting	175
Kolbe, Dr. H., Inorganic Chemistry	86
Le Van, W. Barnett, The Steam Engine Indicator and its Use	523
Plante, Gaston, Recherches Sur l' Electricitie,	349
Proceedings of the United States Naval Institute, Vol. X. The Establishment of steel gun factories in the U. S.	521
Sprague, J. T., M. S. T. E., Electricity	86
Thurston, Prof. R. H., Non-Ferrous Metals and Alloys	174
Valentin, Wm Geo., F.C.S., A Course of Qualitative Analysis	523
Verine, J., Guide der Niveleur	263
Watts, Henry, B.A., Manual of Chemistry	86
Wilson, E.B., Practical Mine Ventilation	263
Winslow, Arthur, Stadia Surveying	349
Wright, T.W., B.A., Treatise on the Adjustment of Observations	322
Batteries, storage	480
Bow girders, strains in	320
Brake, automatic	83
Brazilian railroad, new	346
Brazil, railways in	261
Bridges, preservation of	412
Bridge over the Forth	82, 433
Bridge, Russian	433
Bridges, German	370
Calculation of pressures in stone work	139
Canadian railways	171
Canal, Russian	345
Cannon for the Government	84
Capitol at Albany	242
Castings, steel	167
Catenary, transformed	1
Cause of boiler explosions	353
Cement, Portland	364
Cement, production of	171
Chimnies, construction of	296
Chinese iron foundries	280
Chinese war steamer	84
Chronometers, magnetized	264
Coal, alterations of	180
Coal, anthracite	106
Coal beds of Canada	264
Column, long	108
Combustion of fuel	248
Combustion, spontaneous	387
Compound armor plates	261
Compressed gun cotton	113
Conductivity of copper	72
Conductivity of metals	352
Conductors, electrical	45, 119
Constituent of steel	519
Construction of a dry-dock in quicksand	519
Construction of iron vessels	184
Construction of narrow-gauge railways	486
Consumption of fuel	471
Co-operation in topographical surveys	331
Corrosion in marine boilers	509
Crucible steel	496
Crushing strength of ice	188
Curves, reduction of gradient on	21
Danger in torpedo experiments	348
Danish armor plate trials	225
Defects of steam boilers	234
Delta of the Nile	200
"Delta," steam launch	173
Density of gas mixtures	112
Denudation by rivers	42
Different kinds of armor	64
Discharge of streams	16
Disposal of refuse of towns	154
Distance of the sun	351
Division of land	156
Dome of St. Peter's at Rome	352
Drainage of large marshes	305
Dwelling, aboriginal	308
Earthquake, Krakatoa	411
Efficiency of incandescent lamps	57, 89
Electrical carbons	440
Electrical conductors	45, 119
Electricity, passage of, through gases	189
Electric lamps	57, 89
Electric lighting	217
Electro-magnetic induction	352
Electric mountain railway	172
Electric railway	171
Electric sparks	176
Electro-motive force of accumulators	
Engineering Societies:	
American Society of Civil Engineers	79, 433
Engineers' Club of Philadelphia	80, 169, 517
Institution of Civil Engineers	258
Michigan Association of Surveyors and Civil Engineers	82
Engines, vapor	413
English block system	347
Equivalent of silver	88
European railways	84
Evaporative power of anthracite coal	106

	Page
Examination of Portland cement	364
Experiments in Bantry Bay	435
Experiments with gun cotton	113
Explosions of boilers	353
Explosives, heat action of	10
Extinction of theater fires	33
Figure for arches	1
Finish for steel	83
Fires, prevention of, in theaters	33
Fluid in vapor engines	413
Force of accumulators	155
Formation of sugar	351
Formulæ of pressures in stone work	139
Formula for marking ink	88
Forth bridge	82, 433
Foundations of the new capitol at Albany	242
Foundries, Chinese	280
French railway rolling-stock	520
Friction of car journals	79
Friction of rotation	421
Fuel, combustion of	248
Fuel, consumption of	471
Gases, passage of electricity through	189
Gases separated in steel castings	167
Gas mixtures, density of	112
Gas, transmission of	176
German mile	13
German regulations as to iron bridges	370
Girders, iron and steel	260
Girders, strains in	320
Gold and silver mines	176
Governmental and State surveys	331
Gradient, reduction of	214
Great pyramid, metrology of	226
Grecian railways	347
Gun cotton, experiments with	113
Gutta-percha, artificial	485
Hardening	346
Heat action of explosives	10
Holland, water raising machines in	282
Hot springs	213
How to anneal castings	88
Hydraulic cements	352
Hydraulic pump	83
Ice, crushing strength of	188
Illumination of lighthouses	309
Improvement of tidal rivers	198
Improvements in bronze alloys	352
International railway terminus	347
Incandescent lamps	57, 89
Inclination of sewers	466
India, railroad gauge in	84
Induction, electro-magnetic	352
Ink for marking	88
Ireland, ship canal for	345
Iron and steel	207
Iron and steel, detection of	260
Iron and steel girders	260
Iron Brandywine lighthouse	80
Iron Bridges, construction of	370
Iron bridges, preservation of	410
Iron foundries, Chinese	285
Iron trade	344
Iron vessels, construction of	184
Italian railways	432
Jointed bow girders, strains in	320
Krakatoa earthquake	411
Lake Mœris and the pyramids	402
Lamps, incandescent	57, 89
Land, systematic division of	156
Lartigue's balance railway	347
Lartigue's electric railway	171
Lead fume	216
Lighthouse illuminants	309
Lighting, electric	217
Lighting, ventilation and warmth	299
Locomotive fuel consumption	471
Long column question	103
Longitude by telegraph	63
Machine guns in the field	262
Machines, water raising	282
Magnetism, theory of	24
Magnetized chronometers	264
Manchester ship canal scheme	406
Manufacture of crucible steel	496
Marine boilers, corrosion in	509
Marshes, drainage of	305
"Mascaret" and the tidal wave	193
Mechanical science	399
Metalizing wood	351
Metals, conductivity of	352
Metrology of the great pyramid	226
Mercury in China	319
Mission of science	265
Moncrieff system	172
Monster Russian bridge	433
Motion of water	73
Mountain railway, electric	172
Narrow-gauge railways	486
Natural draught of steam boilers	248
New bayonet	351
New paving material	170
New railroad in Brazil	346
New standard light	88
Nile delta	200
Norwich cathedral tower	342
Observations on hardening	346
Optical theory of the stadia	15
Panama Canal	345
Pan castings, Chinese	280
Passage of electricity through gases	189
Paving material, new	170
Petroleum, Russian	345
Planing machine	259
Plates, armor	261
Portland cement	364
Power, transmission of	30
Practical water raising machines	282
Preservation of beechwood	440
Preservation of coal	180
Preservation of iron bridges	412
Pressure of gas mixtures	112
Pressures in stone work	139
Pressure of wind on different surfaces	512
Prevention of theater fires	33
Primary batteries for electric lighting	217
Problem of the perfect screw	343
Problems, trigonometrical	54
Production of cement from slag	171
Production of steel plates	163
Production of U.S. gold and silver mines	176
Progress in mechanical science	399
Protecting steel from rust	83
Pump, hydraulic	83
Pyramid, metrology of	226
Pyramids and lake Mœris	402
Question, long column	103
Rainfall	16
Railroad gauge in India	84
Railroad in South America	261
Railway accidents	84, 261
Railways in Bosnia	347
Railways in Brazil	261
Railways, Canadian	171
Railways in Greece	347
Railways, narrow gauge	486
Re-arming the navy	435
Reduction of the gradient on curves	214
Refuse-disposal of towns	154
Remedy for defects in steam boilers	234
Removal of deposit from reservoirs	170
Rivers, denudation by	42
Roof truss, analysis of	177
Rotation, friction of	421
Russian canal	345
Russian petroleum	345
Russian steam engine	465
Sailing yachts	164
Science, mechanical	399
Science, mission of	265
Screw gun vessel, new	95
Screw problem, solution of	343
Severn tunnel	433
Sewage in England	83
Sewage of towns	154
Ship canal for Ireland	345
Ship canal, Manchester	406
Size and inclination of sewers	466
Slates, tests of	101
Sliding friction of rotation	421
Softening of water	311
Solar temperature	360
Solution of problems	54
Spontaneous combustion in collieries	387
Stadia, optical theory of	15
Standard light, new	88
Standard thermopile	88
Steam boilers, defects	234
Steam boilers, tests of	106
Steam launch, "Delta"	173
Steel castings	167
Steel, crucible	496
Steel, fine finish for	83
Steel plates, production of	163
Storage batteries	480
Strains in jointed bow girders	320
Streams, discharge of	16
Streets of London	264
Study of iron and steel	207
Sun, temperature of the	14, 205, 369
Supply of water	374, 448
Surveys, State and governmental	331
Systematic division of land	156
System, Moncrieff	172
Telpherage	197
Temperature of deep mines	79
Temperature of the sun	14, 205, 360, 369
Tempering steel by compression	434
Testing Portland cement	364
Tests of iron and steel girders	260
Tests of slates	101
Tests of steam boilers	106
The heavy guns of 1884	90
Theater fires, prevention of	33
Theory of magnetism	24
Theory of the stadia	15
Thermopile, tandard	88
Tidal wave and the "Mascaret"	193
Timber, antiseptic treatment of	494
Torpedo boat, new	479
Torpedo fittings of the navy	521
Tram car engines	346
Transformed catenary	1
Transmission of gas	176
Transmission of power	30
Tricycles and bicycles	144
Truss, analysis of	177
Two manners of motion of water	73
Utilising hot springs	213
Vapor engines, fluids in	413
Ventilation, warmth and lighting	299
Vessels, iron	184
Vortices and the solar system	352
Warmth, ventilation and lighting	299
Water, motion of	73
Water-raising machines, practical	282
Water, softening of	311
Water supply	374, 448
Water supply of Venice	259
Weather and the barometer	392
Welding steel	83
Wind pressure on different surfaces	512
Wind pressure, measurement of	524
Working lead fume into litharge	216
Yachts and yacht sailing	164